

**Claims:**

1. A cyclic process for the removal of sulphur dioxide from a sulphur dioxide containing gas stream using an absorbent medium and for the regeneration of the absorbent medium comprising
  - 5                   a) contacting the gas stream with a lean aqueous absorbing medium containing a sulphur dioxide absorbent to absorb sulphur dioxide from the gas to form a sulphur dioxide lean treated gas stream and spent absorbing medium;
  - b) steam stripping gaseous sulphur dioxide from the spent  
10   absorbing medium at a temperature to form a regenerated aqueous absorbing medium;
  - c) recovering the gaseous sulphur dioxide;
  - d) monitoring the regenerated aqueous absorbing medium and adjusting the level of heat stable salt to maintain the pH of the regenerated  
15   aqueous absorbing medium at a selected pH level; and
  - e) recycling the regenerated aqueous absorbing medium to the contacting step.
2. The process as claimed in claim 1 wherein the selected level is 6 or less.
3. The process as claimed in claim 1 wherein the selected level is 5 or less.
- 20   4. The process as claimed in claim 1 wherein the selected pH level is determined based on a targeted concentration of total dissolved SO<sub>2</sub> in the regenerated aqueous absorbing medium.
5. The process as claimed in claim 4 wherein the targeted concentration of total dissolved SO<sub>2</sub> in the regenerated aqueous absorbing medium is less  
25   than 1.0 wt% based on the total weight of the regenerated aqueous absorbing medium.
6. The process as claimed in claim 4 wherein the targeted concentration of total dissolved SO<sub>2</sub> in the regenerated aqueous absorbing medium is less

than 0.5 wt% based on the total weight of the regenerated aqueous absorbing medium.

7. The process as claimed in claim 1 wherein the absorbent is a diamine that is selected so that, in free base form, the diamine has a molecular weight of less than about 300 and the diamine in half salt form having a pKa value for the free nitrogen atom of about 3.0 to about 5.5, the aqueous absorbing medium containing at least 1 mole of water for each mole of sulphur dioxide to be absorbed and having a heat stable salt concentration of greater than 1 equivalents of acid per mole of diamine prior to the lean aqueous absorbing medium contacting the sulphur dioxide containing gas.

8. The process as claimed in claim 1 wherein the absorbent is selected to have a pKa from 3.0 to 5.5 and the selected pH level is 5.5,

9. The process as claimed in claim 1 wherein the absorbent is selected to have a pKa from 3.2 to 5.0 and the selected pH level is 5,

10. The process as claimed in claim 1 wherein the absorbent is selected to have a pKa from 3.5 to 4.5 and the selected pH level is 5.

11. A cyclic process for the removal of sulphur dioxide from a sulphur dioxide containing gas stream using an absorbent medium and for the regeneration of the absorbent medium comprising

a) contacting the gas stream with a lean aqueous absorbing medium containing a water-soluble half salt of a diamine to absorb sulphur dioxide from the gas to form a sulphur dioxide lean treated gas stream and spent absorbing medium, the diamine in free base form having a molecular weight of less than about 300 and the diamine in half salt form having a pKa value for the free nitrogen atom of about 3.0 to about 5.5, the aqueous absorbing medium containing at least 1 mole of water for each mole of sulphur dioxide to be absorbed and having a heat stable salt concentration of greater than 1 equivalents of acid per mole of diamine prior to the lean aqueous absorbing medium contacting the sulphur dioxide containing gas;

b) steam stripping gaseous sulphur dioxide from the spent absorbing medium at a temperature to form a regenerated aqueous absorbing medium;

c) recovering the gaseous sulphur dioxide; and

5 d) recycling the regenerated aqueous absorbing medium to the contacting step.

12. The process as claimed in claim 11 wherein the gas stream is contacted with the aqueous absorbing medium at a temperature of from about 10° to about 60° C. to absorb sulphur dioxide from the gas stream in amounts of at  
10 least about 100 g of sulphur dioxide per kg of absorbing medium, and gaseous sulphur dioxide is stripped from the spent absorbing medium at a temperature of about 50° to about 110° C and at least about 30° C greater than the contact temperature to form the regenerated aqueous absorbing medium.

15 13. The process as claimed in claim 11 wherein the heat stable salt concentration of the lean aqueous absorbing medium prior to contacting the sulphur dioxide containing gas is selected to be from 1.03 to 1.7 equivalents of acid per mole of diamine.

14. The process as claimed in claim 11 wherein the heat stable salt  
20 concentration of the lean aqueous absorbing medium prior to contacting the sulphur dioxide containing gas is selected to be from 1.05 to 1.45 equivalents of acid per mole of diamine.

15. The process as claimed in claim 11 wherein the heat stable salt concentration of the lean aqueous absorbing medium prior to contacting the  
25 sulphur dioxide containing gas is selected to be from 1.1 to 1.3 equivalents of acid per mole of diamine.

16. The process as claimed in claim 11 wherein the heat stable salt concentration is selected to reduce the concentration of sulfur dioxide in the treated gas stream to a selected level.

17.The process as claimed in claim 11 wherein the heat stable salt concentration is selected to reduce steam consumption in the steam-stripping step.

5 18.The process as claimed in claim 11 wherein the heat stable salt concentration is selected to reduce steam consumption in the steam stripping step to an amount in the range 25 kg steam/kg SO<sub>2</sub> recovered to 2 kg steam/kg SO<sub>2</sub> recovered while producing a sulphur dioxide lean treated gas stream having less than 10 ppm SO<sub>2</sub>.

10 19.The process as claimed in claim 11 wherein the heat stable salt concentration is selected to reduce steam consumption in the steam stripping step to an amount in the range 10 kg steam/kg SO<sub>2</sub> recovered to 2 kg steam/kg SO<sub>2</sub> recovered while producing a sulphur dioxide lean treated gas stream having less than 50 ppm SO<sub>2</sub>.

15 20.The process as claimed in claim 11 wherein the heat stable salt concentration is selected to reduce steam consumption in the steam stripping step to an amount in the range 10 kg steam/kg SO<sub>2</sub> recovered to 2 kg steam/kg SO<sub>2</sub> recovered while producing a sulphur dioxide lean treated gas stream having less than 20ppm SO<sub>2</sub>.

20 21.The process as claimed in claim 11 wherein the pH of the regenerated aqueous absorbing medium is monitored and the level of heat stable salts in the aqueous absorbing medium is adjusted to maintain the pH of the regenerated aqueous absorbing medium at a selected level.

22.The process as claimed in claim 11 wherein the selected level is 6 or less.

23.The process as claimed in claim 11 wherein the selected level is 5 or less.

25 24.A method of reducing the concentration of sulfur dioxide in a treated gas stream comprising:

a) contacting a gas stream with an aqueous absorbing medium containing an amine capable of forming an amine salt, heat stable salt and sulfite, the amine having a pKa less than that of sulfite;

b) stripping gaseous sulphur dioxide from the spent absorbing medium at a temperature to form a regenerated aqueous absorbing medium;

c) recovering the gaseous sulphur dioxide;

d) recycling the regenerated aqueous absorbing medium to contacting step (a); and,

e) adjusting the aqueous absorbing medium to have a heat stable salt concentration sufficient to at least essentially neutralize the sulfite in the aqueous absorbing medium.

25. The method as claimed in claim 24 wherein the amine is part of a diamine and the method comprises adjusting the heat stable salt concentration of the aqueous absorbing medium to be greater than 1 equivalents of acid per mole of diamine.

26. The method as claimed in claim 24 wherein the aqueous absorbing medium contains a water-soluble half salt of a diamine to absorb sulphur dioxide from the gas stream to form a sulphur dioxide lean treated gas stream and a spent aqueous absorbing medium, the diamine in free base form having a molecular weight of less than about 300 and the diamine in half salt form having a pKa value for the free nitrogen atom of about 3.0 to about 5.5, the aqueous absorbing medium containing at least 1 mole of water for each mole of sulphur dioxide to be absorbed and comprising less than about 80 wt. % of water and the method comprises adjusting the heat stable salt concentration of the aqueous absorbing medium to be from 1.05 equivalents of acid per mole of diamine to 1.45 equivalents of acid per mole of diamine.

27. The method as claimed in claim 24 wherein the method further comprises adjusting the composition of the aqueous absorbing medium such that the pH of the regenerated aqueous absorbing medium is 6 or less.

28. The method as claimed in claim 24 wherein the method further comprises adjusting the composition of the aqueous absorbing medium such that the pH of the regenerated aqueous absorbing medium is 5.0 or less.

29. The method as claimed in claim 24 wherein the composition of the  
5 aqueous absorbing medium is adjusted by varying the level of heat stable salt in therein.